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## **Domain and vocabulary extension. Reply to Bert Hamminga**

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Theo A. F. Kuipers

## DOMAIN AND VOCABULARY EXTENSION

### REPLY TO BERT HAMMINGA

Over the years, Bert Hamminga, a philosopher of economics, has demonstrated an interest in empirical progress and truth approximation. Thanks to him, I have been able to develop an alternative way of truth approximation (ICR, pp. 271-2, pp. 288-98; SiS, pp. 33-4) especially for economic research or, more generally, research driven by an “interesting theorem,” as analyzed by Hamminga (1983). Hamminga’s present contribution concludes by considering economic theorizing once again. Before doing so, he presents a set of very adequate “pocket maps” for truth seekers and a provocative diagnosis of Lakatos’ notion of “novel facts” and requests further attention to two important topics: domain extension and vocabulary extension.

I will come back to these extensions in some detail, but let me first remark that I like the pocket maps very much. I see them as a fresh representation of my basic ideas. I have just one critical and a (related) constructive remark. When dealing with the “second consolation,” in Section 1, Hamminga suggests a difference between  $R(t)$  and  $S(t)$  which seems to me somewhat exaggerated. The suggestion is that  $R(t)$  is asymmetric in that its members have been established as real or nomic possibilities, whereas its non-members have not (yet) been established as nomic impossibilities. However, I would say that  $S(t)$  is similarly asymmetric in that the non-members of  $S(t)$  have been established-in-a-certain-sense as nomically impossible, viz. by accepting a law that excludes them, whereas its members, as far as non-members of  $R(t)$  are concerned, have not (yet) been established as nomically possible. In both cases, only the first types of (non-)members are used for comparisons, viz. established members of  $R(t)$  (and hence of  $S(t)$ ) and established non-members of  $S(t)$  (and hence of  $R(t)$ ), respectively.

Maybe the intuitive asymmetry Hamminga has in mind has to do with the different status of being established, which inspired me to make the following terminological proposal.

Recall that  $R(t)$  contains all established possibilities, that they represent (new) established internal matches if they belong to  $Y$  (and not to  $X$ ), that they

represent (new) established internal mistakes if they do not belong to  $Y$  (but do belong to  $X$ ). Now laws are established on the basis of  $R(t)$ . One can even say that  $R(t)$  results in large measure from testing hypothetical laws. These laws are of course a kind of inductive generalizations. Hence, instead of speaking of established laws, one might speak of “induced laws.” More importantly, the non-members of  $S(t)$  might well be called “induced impossibilities,” instead of “law-established impossibilities” and the like (established law mistakes and matches). This would emphasize the different nature of establishment of nomic impossibilities as opposed to possibilities. Similarly, non-members of  $S(t)$  not in  $Y$  (but in  $X$ ) would become “(new) induced impossibility matches” and members of  $S(t)$  in  $Y$  (but not in  $X$ ) would become “(new) induced impossibility mistakes.”

Hamminga’s argumentation for the diagnosis that the notion of novel fact of Lakatos is not so much related to Popper’s notion of “empirical content” of a theory, that is, to its forbidden possibilities, but to its allowed possibilities, seems quite convincing to me. In addition, following Lakatos, such a possibility should be excluded by the old theory and experimental evidence should exemplify it beyond reasonable doubt. However, Hamminga goes on to relate the particular case, a thusfar not discovered planet, Neptune, to the general topic of domain extension. Here, I have some doubt about his treatment. Moreover, I have some problems with his treatment of vocabulary extension. These kinds of extension are the subject of the rest of this reply.

### Domain Extension

Under the heading “inadequate  $Mp$ ’s,” Hamminga introduces the possibility that the old theory did not say anything about new planets and hence that the domain of the theory has to be modified. However, I think that this need not be the case for the introduction of a new planet, depending on the type of conceptual possibilities  $Mp$  is made of. Either the intended applications, constituting the domain of the theory, deal with two-object (planet-sun) systems or with “planetary systems” in general, systems with at least two objects, one of which has considerably more mass than all the others. In both cases, there are lots of conceptual possibilities that can take a new planet into account, among other objects. However, if the new theory concerns the transition from the first (two-object) to the second (general) type of theory, the new  $Mp$  is of a really different nature than the old one. It has to take the so-called many-objects (more than 2) problem into account; as is well known this has to be done in an approximate way. This would correspond to Hamminga’s (1983) notion of “field extension” for international trade when going from two

countries to three or more. However, in the case of Neptune, taking more than one planet into account (by approximation) had already been done before 1983.

To be sure, substantial domain extension is an important activity in scientific research and the ICR theory of truth approximation does not yet deal with this. It assumes a fixed domain. That is, I start from a fixed primitive set of applications  $D$  which amounts to the subset  $T$  of  $Mp(V)$  when conceptualized by a (richer) vocabulary  $V$ . Hence we may write:  $T = Mp(D)$ . (For some refinement in terms of a domain vocabulary, see ICR, pp. 326-7 Section: 13.5). This leads directly to two types of strengthening of a theory, as suggested by Zwart (1998/2001), that is, by reducing the set of allowed possibilities or by enlarging the domain (see the last paragraph of Ch. 8, pp. 206-7, in particular the last five lines):

Finally, variable domains can also be taken into account, where the main changes concern extensions and restrictions. We will not study this issue, but see (Zwart 1998 [2001], Ch. 2-4) for some illuminating elaborations in this connection, among other things, the way in which strengthening / weakening of a theory and extending / reducing its domain interact.

Hence, at least some new pocket maps will have to be designed in order to take empirical progress and truth approximation by domain extension – or domain reduction – into account, leaving the theory fixed. In my reply to Zwart I make a first attempt to formally design such maps.

### Vocabulary Extension

Hamminga also turns his attention to vocabulary extension. However, here his formulations frequently suggest an essentialist kind of realism that I would not wish to endorse. Talk about ‘proper’ or ‘correct super-*Mp*’s’, is more or less explicitly declined in ICR (p. 231) by rejecting the ideal language assumption and replacing it by the Popperian refinement principle. This only allows the possibility of comparing various kinds of success of vocabularies (ICR, p. 234).

To be sure, change of vocabulary is not an easy task to deal with, and my trivial kind of fusion of languages (ICR, pp. 230-5) is such that the number of theory comparisons that can be made will be very small. However, simple extension of language to deal with new kinds of objects and attributes is relatively easy. As a matter of fact, the treatment of stratified theories in observational and theoretical terms is formally a matter of vocabulary extension.

Let me finally note that Hamminga’s very intriguing last section, about “The Net and the Spider”, refers to Popper’s net metaphor as a metaphor for

theories. In the very last section of ICR I argue that that metaphor is much better suited for vocabularies (see also my reply to Mooij). Be this as it may, Hamminga is right in suggesting that the spiders, that is, the researchers, only figure implicitly in the picture developed in ICR.

## REFERENCES

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